Claims

We claim:

1. A method for encoding a video including a sequence of frames, comprising:

measuring a variance of pixel intensities in a current frame;

assigning, according to rate and buffer fullness constraints, a number of bits to encode the current frame;

determining a multiplier value directly as a function of only the variance and the number of bits assigned to the current frame;

estimating motion vectors between a reference frame and the current frame;

determining a sum of absolute difference (SAD) based on a motion compensated residual between the reference frame and the current frame;

selecting an encoding mode for each macro block in the current frame based on the sum of absolute difference, the motion vectors and the multiplier value; and

encoding the motion compensated residual based on the encoding mode, multiplier value and the number of allocated bits.

2. The method of claim 1, in which the encoding further comprises:

determining a quantization scale as a function of only the multiplier value and the number of bits assigned to the current frame;

extracting rate and distortion information associated with encoding each macro block in frame DCT mode and field DCT mode;

selecting a DCT type for each macro block in the current frame based on the multiplier value and the rate and distortion information;

transforming each macro block according to the selected DCT type;

quantizing each transformed macro block according to the selected quantizer; and

variable-length coding each quantized macro block as a bitstream.

3. The method of claim 1, in which the multiplier value is $\lambda = -\frac{d(D(R))}{d(R)}$, where D is the distortion, and R is the rate.

4. The method of claim 1, in which the multiplier value is $\lambda = 2 \ln 2 \times \sigma^2 2^{-2R}$, where R is the rate, and σ^2 is the variance.

5. The method of claim 1, in which the multiplier value is $\lambda = F_1(R) \times \sigma^2 2^{-2R}$, where R is the rate, and σ^2 is the variance, and $F_1(R) = \frac{c}{R}$, where c is a constant.

6. The method of claim 1, in which the multiplier value is $\lambda = c\sigma^2 \frac{2^{-2R}}{R}$, where R is the rate, c is a constant, and σ^2 is the variance.

7. The method of claim 6, in which $c = c*(0.5*R1/R+0.5)$.

8. The method of claim 1, in which the selecting of the encoding mode further comprises:

minimizing a cost function $\mathrm{cost} = D + \lambda R$, where D is the distortion, R is the rate, λ is the multiplier;

modeling the distortion D by $D(Q, SAD) = a \times Q \times SAD$, where a is a constant coefficient; and

modeling the rate by $R(Q, SAD) = MV + b \times SAD / Q$, where MV is an encoding rate for the motion vectors, and b is a constant coefficient.

9. The method of claim 2, in which the selecting of the DCT type is based on the multiplier.

10. The method of claim 2, in which the quantization scale is selected with a sliding window.